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DESCRIPTORS Instructional Materials; *Laboratory Procedures; Postsecondary Education; *Sludge; Teaching Guides; *Training Methods; *Waste Water; *Water Treatment
IDENTIFIERS Settleometer Test

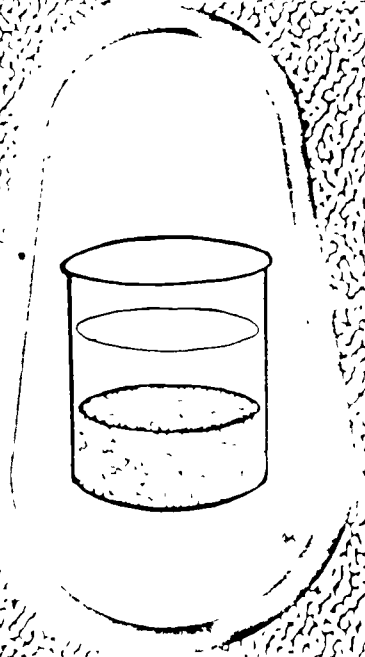
ABSTRACT

The settleometer test is used to indicate the solids-liquid separation (downtime) capability of sludge, most commonly on activated sludge entering the secondary clarifier and aerobic digesters. Designed for individuals who have completed National Pollutant Discharge Elimination System (NPDES) level 1 laboratory training skills, this module provides waste water treatment plant operators with the basic skills and information needed to: (1) run the settleometer test to determine solids settleability; (2) accurately record data and observations; and (3) obtain consistent and reliable data from the test procedure. The instructor's manual contains a statement of instructional goals, lists of instructor/student activities and instructional materials, narrative of the slide/tape program used with the module, overhead transparency masters, and student worksheet (with answers). The student workbook contains objectives, prerequisite skills needed before the module is started, sources of settleometers, laboratory procedures, and worksheet. (Author/JN)

Operational Control Tests

for Wastewater Treatment Facilities

Settleometer



Instructor's Manual

Linn-Benton Community College
Albany, Oregon

SETTLEOMETER

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National Training and Operational Technology Center
Cincinnati, Ohio

Developed Under
EPA Grant #900953010
August, 1981

SETTLEOMETER

CONTENTS

INSTRUCTIONAL GOALS

Upon completion of this lesson the student should be able to successfully run the settleometer test and accurately record the data and observations.

INSTRUCTOR ACTIVITY

For best results follow this sequence:

	Activity	Time
1.	Review the objectives with the students.	5 minutes
2.	Have the students read through the procedures.	10 minutes
3.	View the slide program.	10 minutes
4.	Discuss the settleometer scale.	10 minutes
5.	Demonstrate the test procedure.	15 minutes
6.	Assign the worksheet.	10 minutes
7.	Correct the worksheet.	5 minutes
8.	Perform the test.	75 minutes

Other Activities:

1) Using samples clarify the type of information that is, to be gathered from the visual observation of supernatant, interface, and sludge. You may also use the slides and more through them slowly identifing the visual observation clues.

2) If time permits and you are interested in the students being able to calculate SSC values from the SSV data you will want to turn to appendix B for some AV support and examples.

3) Again if time allows and if you are using the data for activated sludge you may want the students to plot the SSV and SSC data. See Appendix C for example of curve form and visual helps.

STUDENT ACTIVITIES

1. Read the objectives.
2. Read the procedure.
3. View the slide program.
4. Complete the worksheet.
5. Perform the test.
6. Record data.

INSTRUCTIONAL MATERIALS LIST

1. Instructors Guide Settleometer
2. Student Workbook Settleometer
3. 35 mm projector
4. Cassette recorder with automatic synchronization
5. Projector screen
6. Overhead projector
7. Equipment listed in the Lab Procedure

SETTLEOMETER

NARRATIVE.

Slide #

1. This lesson covers the determination of the settleability of sludge using a two liter settleometer.

2. The lesson was written by Mr. E. E. Arasmith. Instructional development was done by Priscilla Hardin. Dr. John W. Carnegie was the project manager.

3. The ability to observe and measure the rate and characteristics of solids separation is essential for operational control of the biological treatment processes in which sludge is produced.

4. A common method of making this determination is with the use of the settleometer.

5. This test is commonly used with the activated sludge process to determine the settling characteristics of the sludge, and

6. with aerobic digesters to determine the length of time required for the sludge to settle.

7. The equipment for this test includes a timer and a two liter Mallory direct reading settleometer with a stirring paddle, and a data sheet.

8. What is a two liter Mallory direct reading settleometer? First of all it is a wide bodied cylinder that is at least 10 centimeters in diameter, made of glass or plastic.

9. The wide-mouth settleometer more closely resembles clarifier conditions than does the narrow, graduated cylinder. Using the settleometer results in more accurate estimations of sludge volume and settleability.

10. What is meant by direct reading? The settleometer which holds two liters of sample has a scale that does not match its volume but is, instead, a ratio scale that is the ratio of sludge to total volume. Let's take a close look at this scale.

11. Notice that the scale is marked off from 0 to 1,000 cubic centimeters per liter and is usually referred to as cc's per liter. Although this scale does not appear to reflect the total two liters of volume it does, in fact, do so. For further details about the relationship of the scale to the two liters, see the student manual.

12. The settleometer tests involves four steps: collection of sample, test procedures, recording data, and clean-up.

13. The sample collection is relatively simple. At least two and a half liters of representative sample should be collected and delivered to the lab within 15 minutes.

14. Keep in mind that biological sludges are undergoing constant change. The accuracy of the test depends on looking at the sludge within the system. Therefore, the shorter the holding time, the closer the results will represent the plant condition.

15. The test procedure itself involves stirring the sample, pouring two liters into a settleometer, stirring again, and observing and recording the level of the settling sludge at specific time intervals. Let's take a closer look at each of these steps.

16. After arriving at the lab the samples should be thoroughly but gently mixed. Gently mix by moving the paddle back and forth. Don't shake the sample.

17. Then immediately pour the sample into the settleometer. This transfer must be made quickly so that the sludge does not settle in the sample container.

18. Again, using the wide paddle, gently stir the contents of the settleometer with a back and forth motion. This will assure a complete mix of the sludge.

19. Now carefully slow the motion of the sample by gently stopping the paddle. This assures a motionless condition at the start of the settling process.

20. When all motion in the sample has stopped, slowly lift the paddle up.

21. You are now ready to observe the sludge as it settles and record the data.

22. During the first few minutes the sludge will begin to flocculate, form a blanket and settle.

23. As the blanket forms, the operator will observe the development of the settling process and the formation of the interface between the sludge and the supernate.

24. The SSV, or settled sludge volume, is determined by reading the scale at the top of the sludge blanket.

25. This test may be used for both activated sludge and aerobic digesters. The test method is the same for both but the reading procedure is different. Let's look at the activated sludge procedure first.

26. The settleometer should be read every five minutes during the first 30 minutes and each 10 minutes during the next 30 minutes.

27. During the first five minutes of settling, observe and record the characteristics of the supernatant, interface and floc.

28. First of all, is the floc flocculant or dispersed?

29. Is the development of the interface well defined or ragged?

30. Is the supernatant clear or turbid?

31. And, finally, if the supernatant is turbid is there a definite appearance of pin floc or straggler floc?

32. At this point in the test one complete hour has elapsed. This is the main portion of the test. However, the level of the sludge should be observed and recorded every hour for the next hour hours or until it rises. This concludes the use of the settleometer with activated sludge. Let's look at its use with the aerobic digester.

33. With aerobic digesters, the intent is to determine the time it takes for the sludge to settle to ultimate compaction. And then to determine the length of time that elapses before the sludge rises.

34. Settling to ultimate compaction will usually occur within 1 to 5 hours. So record the level after 30 minutes and then again after one hour. And then each hour for at least another 4 hours.

35. Observations and recordings should be continued each hour until the sludge rises.

36. After the sludge has reached ultimate compaction, the appearance of the supernatant should be observed and recorded. Is it clear or turbid? We have now concluded the last step in the aerobic digester procedure.

37. After the last reading, the settleometer should be emptied and cleaned by washing with soapy water and rinsing with tap water and then drying either with a soft towel or being allowed to drip-dry.

38. Let's review what we have learned in this lesson. We discussed the use of the settleometer in determining the settling characteristics of activated sludge and of aerobically digested sludge.

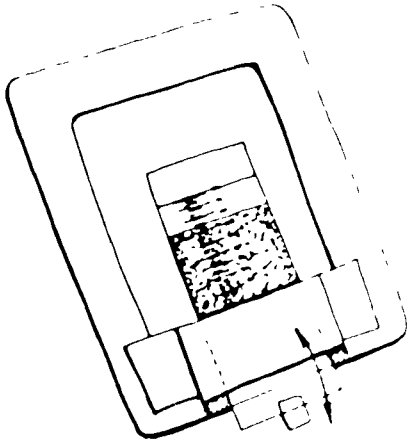
39. We saw that the test followed four basic steps.

40. And finally, we discussed the test details and the visual observations necessary to obtain adequate data for the interpretation of the settling characteristics of sludge.

APPENDIX A

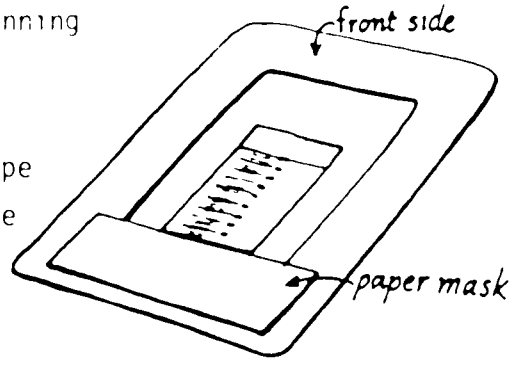
This appendix should be used with the overheads that follow. There is usually some confusion in understanding the settleometer scale. You may wish to use the following two overheads to explain and practice reading the scale.

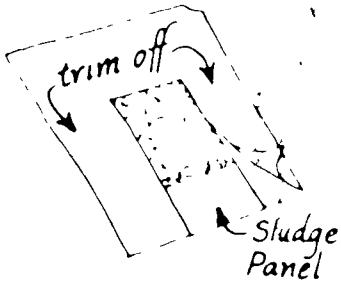
OH #1 - First the settleometer contains 2 liters of sludge. Second, the scale indicates a relationship of cc/l. The scale is a ratio of sludge volume to total volume. It would not make any difference how much the settleometer held, (2 liters or 100 gallons) when it is full the ratio of sludge to total volume is 1000 cc's of sludge per liter of volume. When it settles half way to 500 cc's then the ratio of sludge to total volume is 500 cc's per liter of volume. This is the ratio of sludge for each liter of volume. This is why the settleometer is called direct reading. It directly indicates the ratio of sludge to total volume.



OH #2 - A settleometer overhead transparency with scale and adjustable, sliding sludge panel enables students to practice reading different levels of settled sludge. The masters for this overhead come in two parts: Settleometer (St-9) and the Sludge Panel (St-10). Instructions for constructing the Sludge Panel Guide follow.

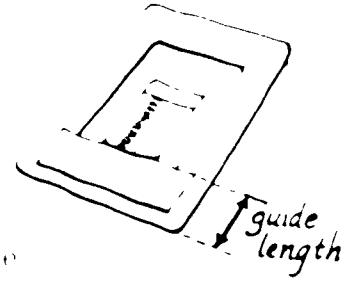
1. Convert the masters to overhead transparency film. Use a film with a stiff, heavy quality acetate base.
2. Mount the Settleometer transparency squarely in a standard transparency frame.
3. Cut a strong piece of paper or light weight card stock to fit over the lower part of the transparency beginning at the bottom edge of the settleometer and extending onto the frame at both sides and the bottom. See drawing. Tape or glue the paper mask into place on the front side of the transparency.



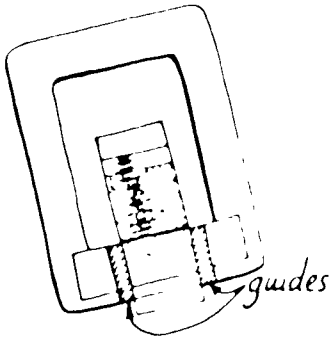


4. Next, create the sliding Sludge Panel ("t-1") for use on the Settleometer transparency. Trim away the long sides and one end as shown. Be sure that you cut accurately, making the long sides parallel and exactly as wide as the settleometer image.

5. Cut two guides from a sheet of thin cardboard, the kind used on the back of a pad of paper. Make them ½" wide and long enough to reach from the lower edge of your transparency, where the Settleometer is mounted on it. Now you are ready to glue the guides in place.

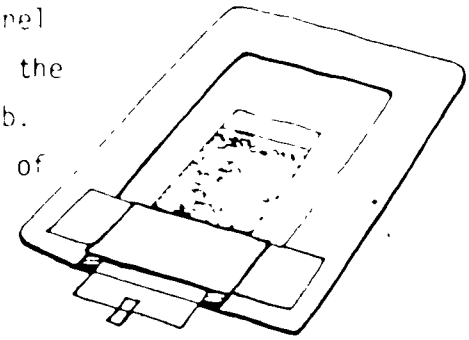


6. To position the guides, place the Sludge Panel precisely over the settleometer as if it was entirely full of sludge. The clear part of the panel should extend down across the bottom of the settleometer and onto the stiff masking paper. Place the cardboard guides on the masking paper on each side of the Sludge Panel. Glue them in place snuggly against the edges of the panel.

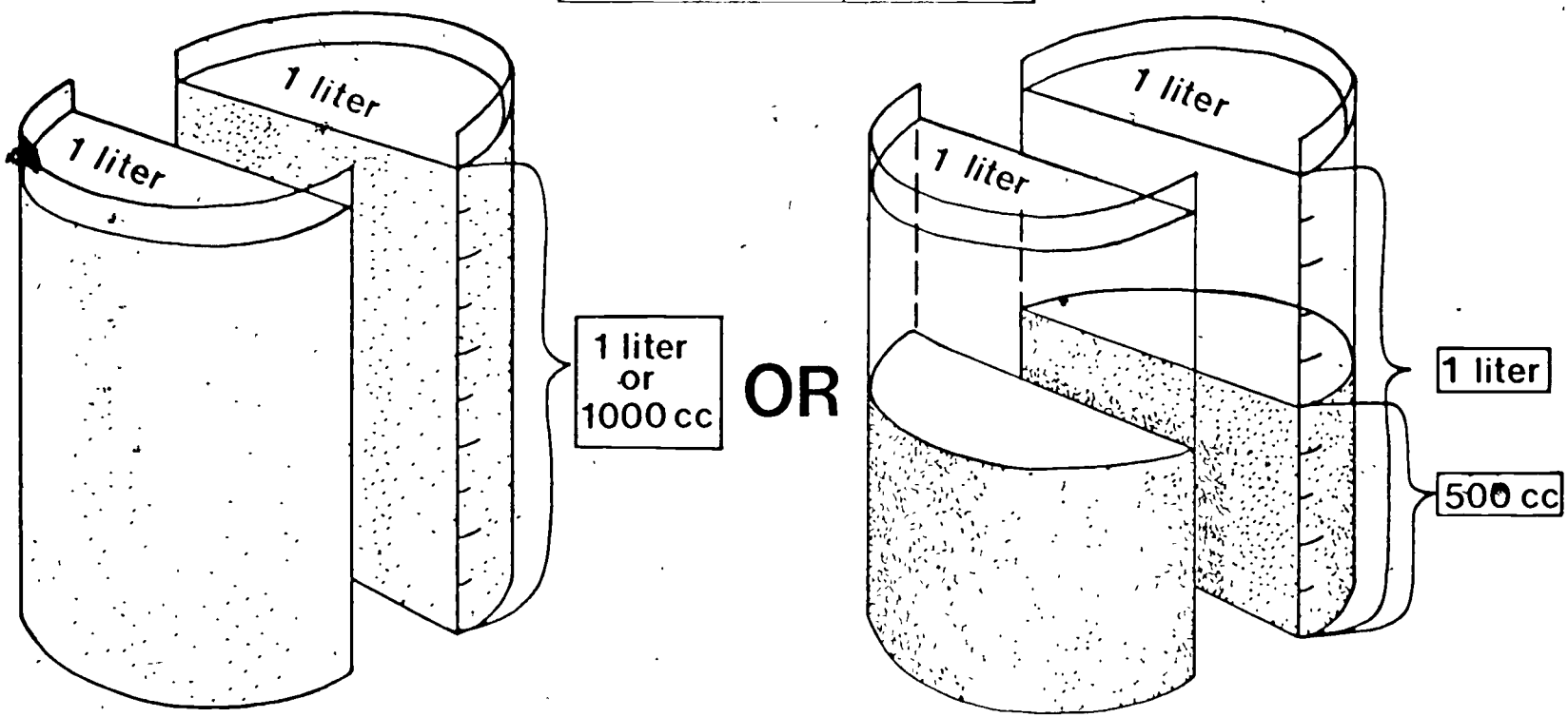


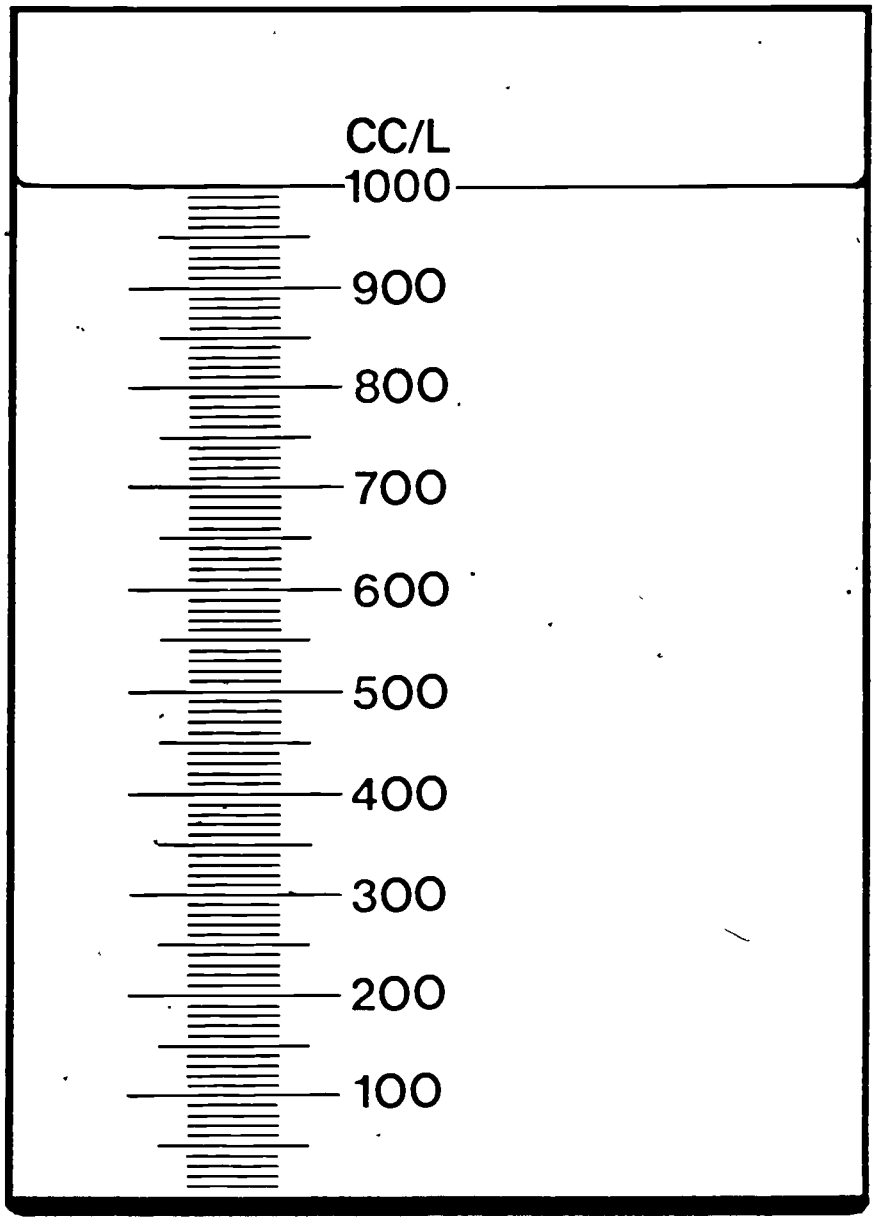
7. Complete the sliding panel housing by cutting a piece of cardboard or stiff paper to fit across the two guides and the panel in between them. Remove the panel for protection and glue the paper to the guides, taking care to confine the glue to the guides only.

8. When the glue is dry, slip the Sludge Panel into the slot between the guides so that the clear part extends downward as a pull tab. Attach a masking tape flap to the center of the pull tab to aid in moving the Sludge Panel up and down in the slot.



solids volume / total volume




CC/L
1000
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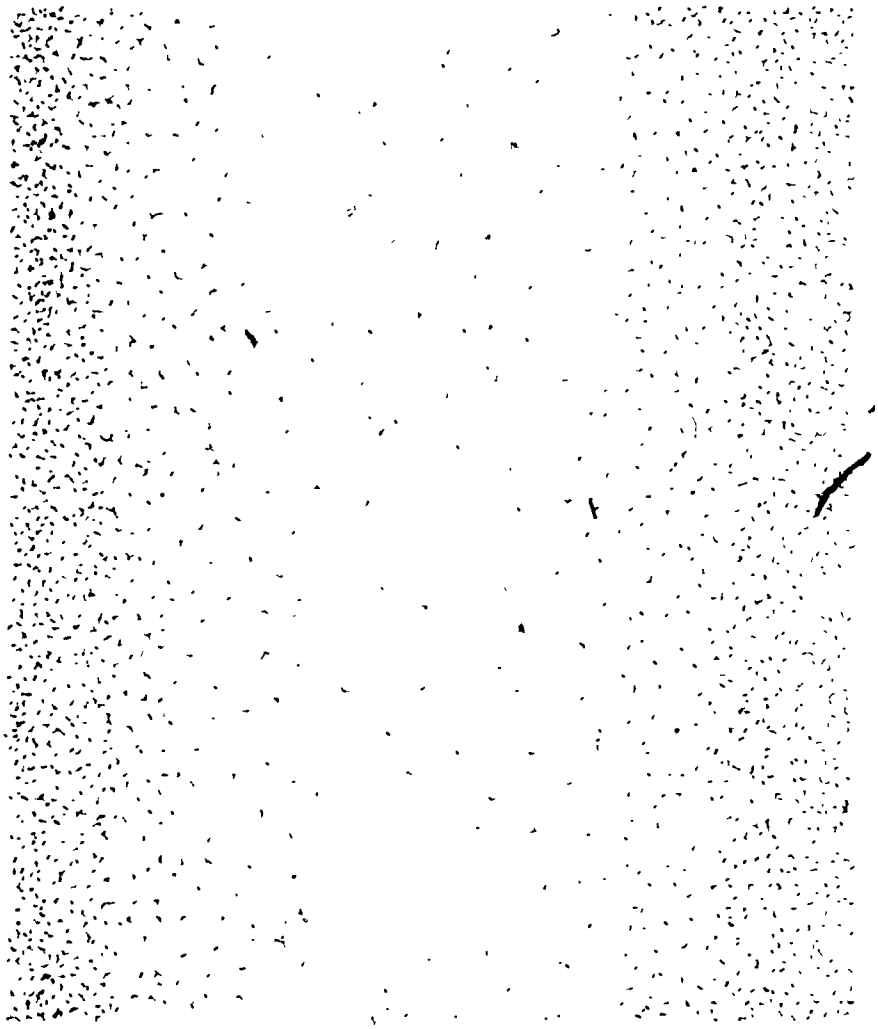
800
700
600
500
400
300
200
100



APPENDIX B

SSC is settled sludge concentration, that is, it is the concentration of the sludge at any point in time.

As the sludge settles the sludge becomes more concentrated. By knowing the concentration at the start of the test and by observing the volume of sludge at any point in time the concentration of that sludge can be computed. Using the following formula:

$$SSC = \frac{ATC\ (1000)}{SSV}$$

Where ATC is the aeration tank concentration as determined by a centrifuge and expressed in percent.

Example:

OH #3: If the SSC at the start of a test were 3% and the sludge settled to 500 cc/l in 5 minutes then all of the sludge would now occupy 500 cc's of volume. That means that the concentration of the sludge should have doubled. That's because all of the sludge is in 1/2 of its original volume.

OH #4: By the same logic we see that when the sludge settles to 250 cc/l the concentration is now 4 times what it was originally. That is, the sludge now occupies 1/4 of its original volume.

Notice that SSC value is always a time-based value.

There are three examples of SSV reading given on the attached page. We have already calculated the SSC reading for you and placed them on three overheads (OH #5, 6 and 7). We suggest that you use the blank SSV/SSC data overhead (OH #8) to calculate the values for the class then allow the class to calculate the data on sheets 2 and 3. Sheet 4 is for your use with data that you may have from a real test.

This data is displayed on overheads number 9 thru 8. Values taken from 3 and 4 will match the data in test #1 overhead #5. Settling curves for this data can be found in Appendix C.

Time of Test 1		
Time	SSV CC/L	SSC %
0	1000	3
5	500	6
10	400	7.5
15	325	9.2
20	290	10.3
25	260	11.5
30	250	12
40	220	13.6
50	200	15
60	200	15

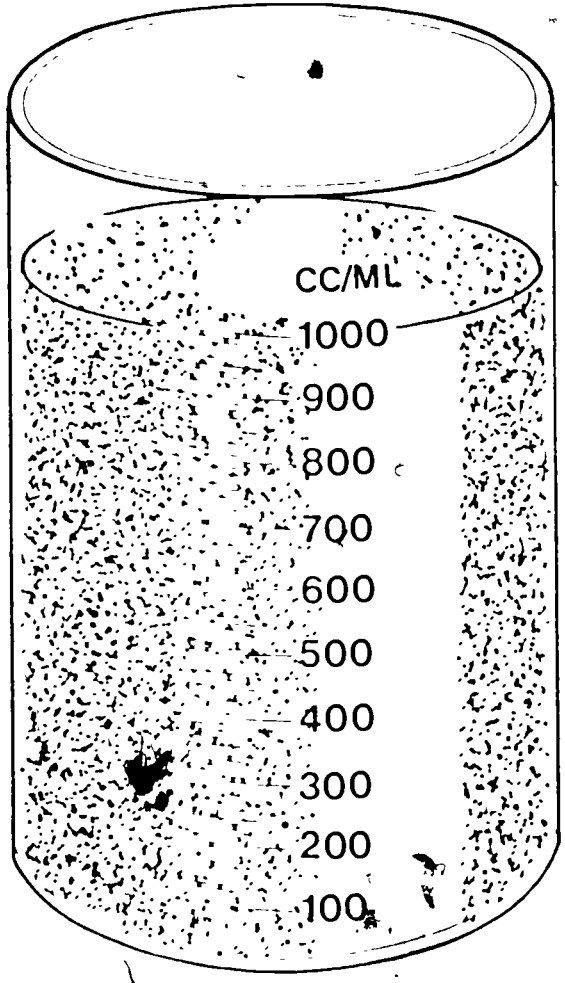
Time of Test 2		
Time	SSV CC/L	SSC %
0	1000	3
5	950	3
10	900	3.1
15	950	3.15
20	925	3.2
25	900	3.3
30	875	3.4
40	825	3.6
50	750	4.0
60	700	4.3

Time of Test 3		
Time	SSV CC/L	SSC %
0	1000	3
5	400	5.8
10	340	9.7
15	250	12.0
20	200	15.0
25	170	17.6
30	150	20
40	150	20
50	150	20
60	150	20

Time of Test ____		
Time	SSV CC/L	SSC %
0	1000	
5		
10		
15		
20		
25		
30		
40		
50		
60		

T = O

ATC = 3%



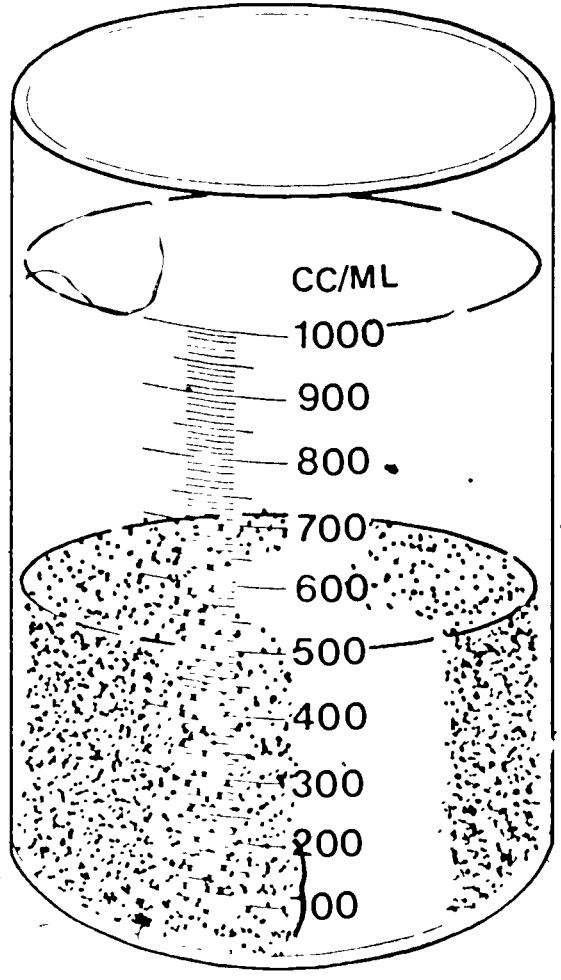
SSV = 1000 cc/l

$$SSC = \frac{3\% \times (1000)}{1000}$$

$$= 3\%$$

T = 5 min

ATC 3%



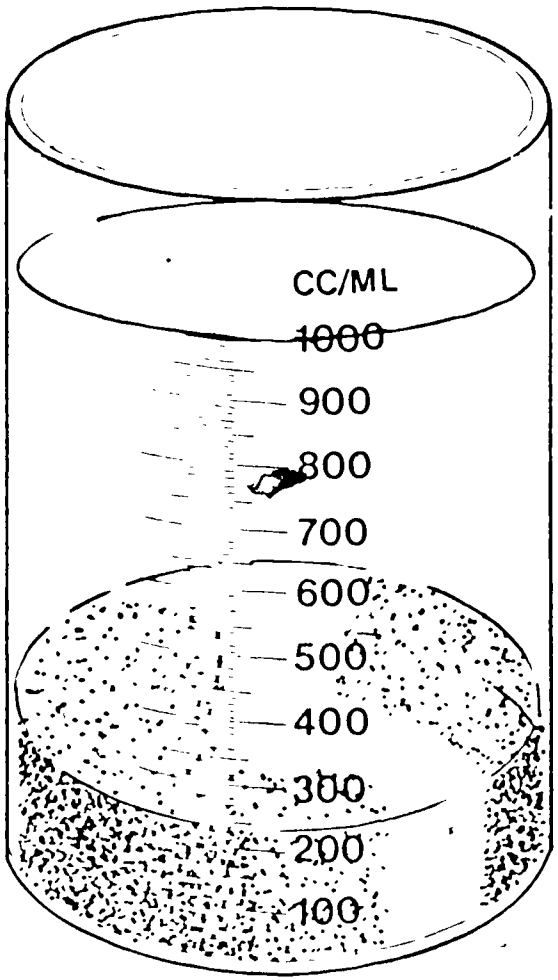
SSV = 500 cc/l

$$SSC = \frac{3\% \times (1000)}{500}$$

$$= 6\%$$

T= 30 min

ATC = 3%



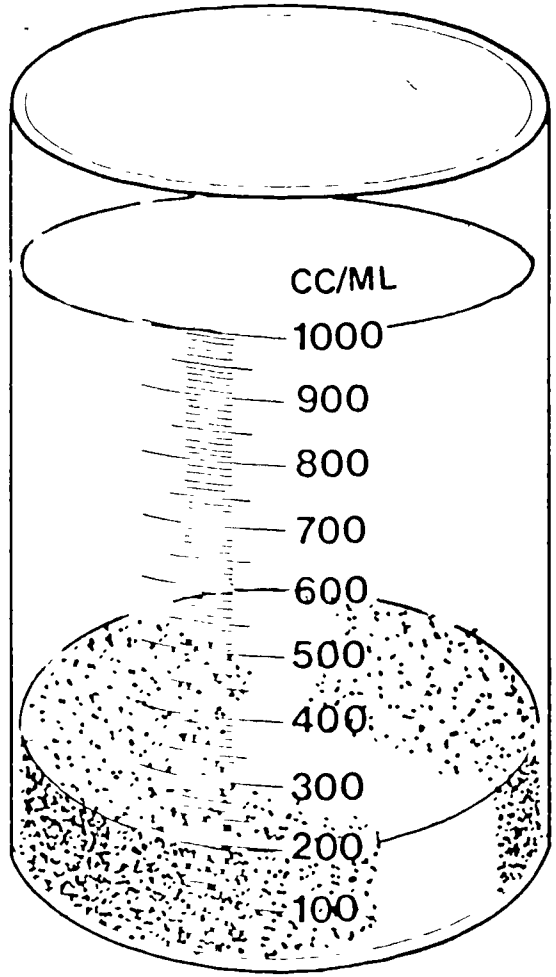
SSV= 250 cc/l

$$SSC = \frac{3\% \times (1000)}{250}$$

$$= 12\%$$

T=60 min

ATC = 3%



SSV = 200 cc/l

$$SSC = \frac{3\% \times (1000)}{200}$$

$$= 15\%$$

Time of Test 1		
Time	SSV CC/L	SSC %
0	1000	3
5	500	6
10	400	7.5
15	325	9.2
20	290	10.3
25	260	11.5
30	250	12
40°	220	13.6
50	200	15
60	200	15

Time of Test 2		
Time	SSV CC/L	SSC %
0	1000	3
5	990	3
10	970	3.1
15	950	3.15
20	925	3.2
25	900	3.3
30	885	3.4
40	825	3.6
50	750	4
60	700	4.3

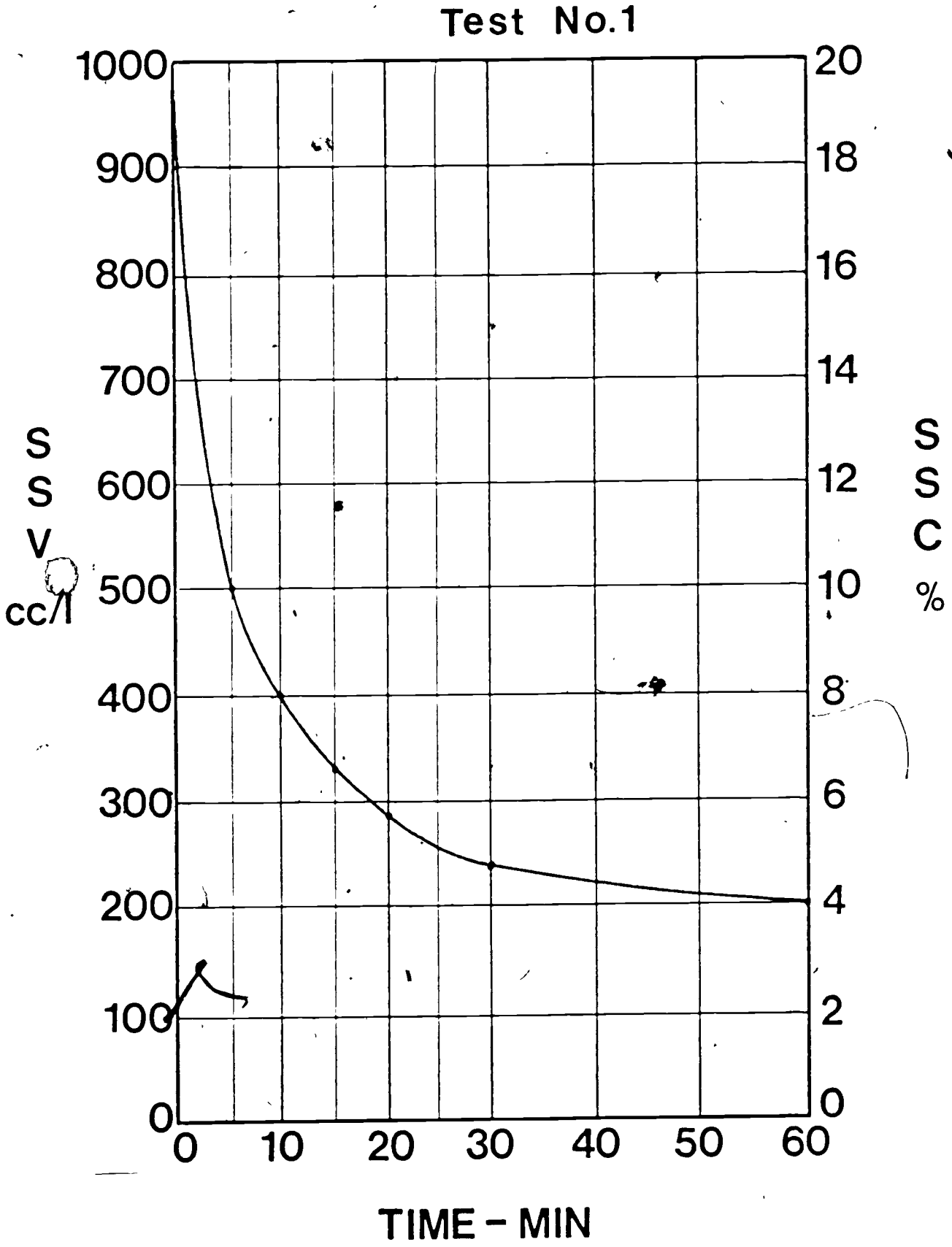
Time of Test 3		
Time	SSV CC/L	SSC %
0	1000	3
5	510	5.8
10	310	9.7
15	250	12
20	200	15
25	170	17.6
30	150	20
40	150	20
50	150	20
60	150	20

Time of Test _____

Time	SSV CC/L	SSC %
0	1000	
5		
10		
15		
20		
25		
30		
40		
50		
60		

APPENDIX C

The data that has been calculated on the data sheets in Appendix B has been plated on the attached curves. There is also a blank curve for your use with your own data.


Test No.1
1000
900
800
700
600
500
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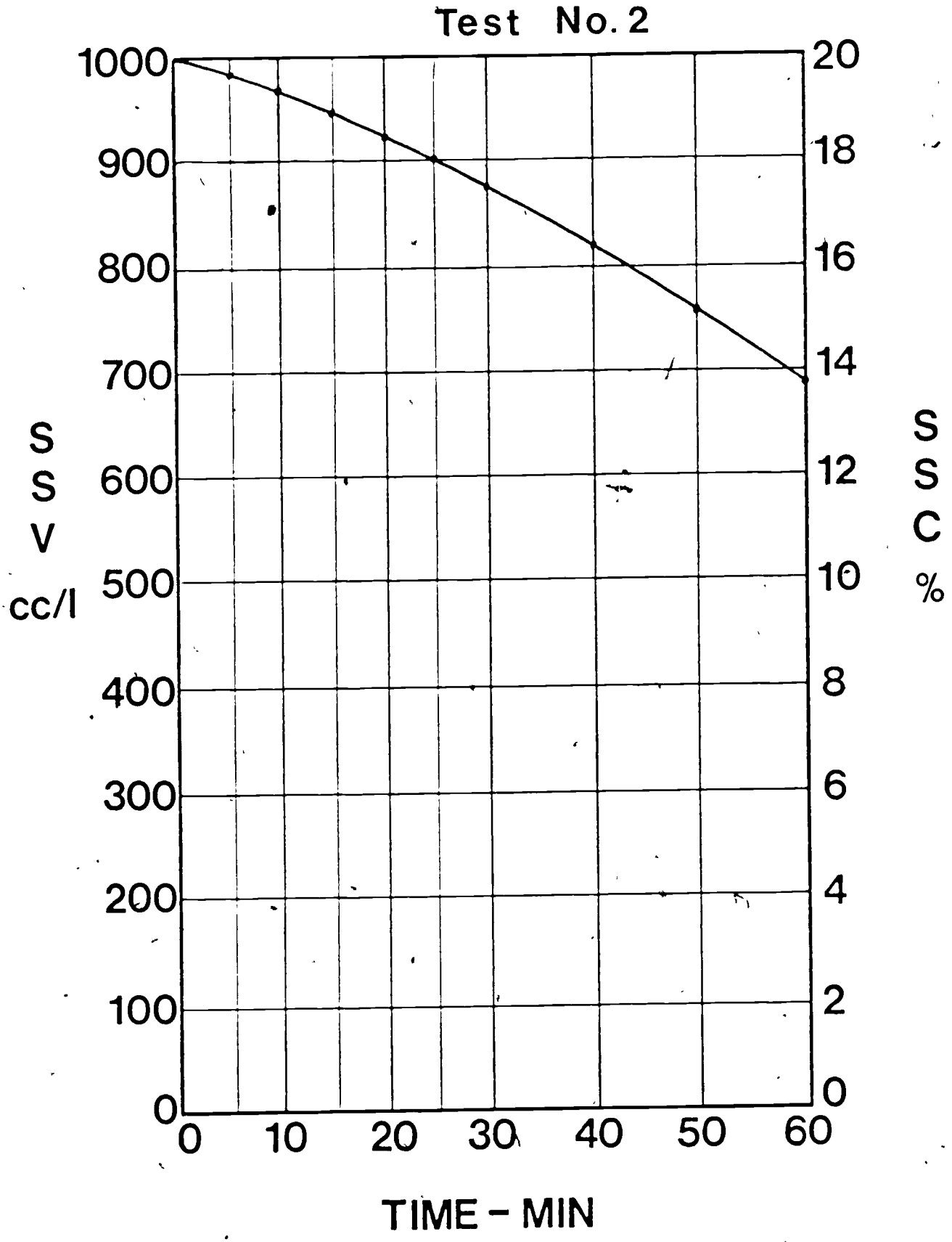
300
200
100
0
SSV cc/l
20
18
16
14
12
10
8
6
4
2
0
SSC %
0
10
20
30
40
50
60
TIME - MIN


Test No. 2
SSV cc/l
1000
900
800
700
600
500
400
300
200
100
0
SSC %
20
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12
10
8
6
4
2
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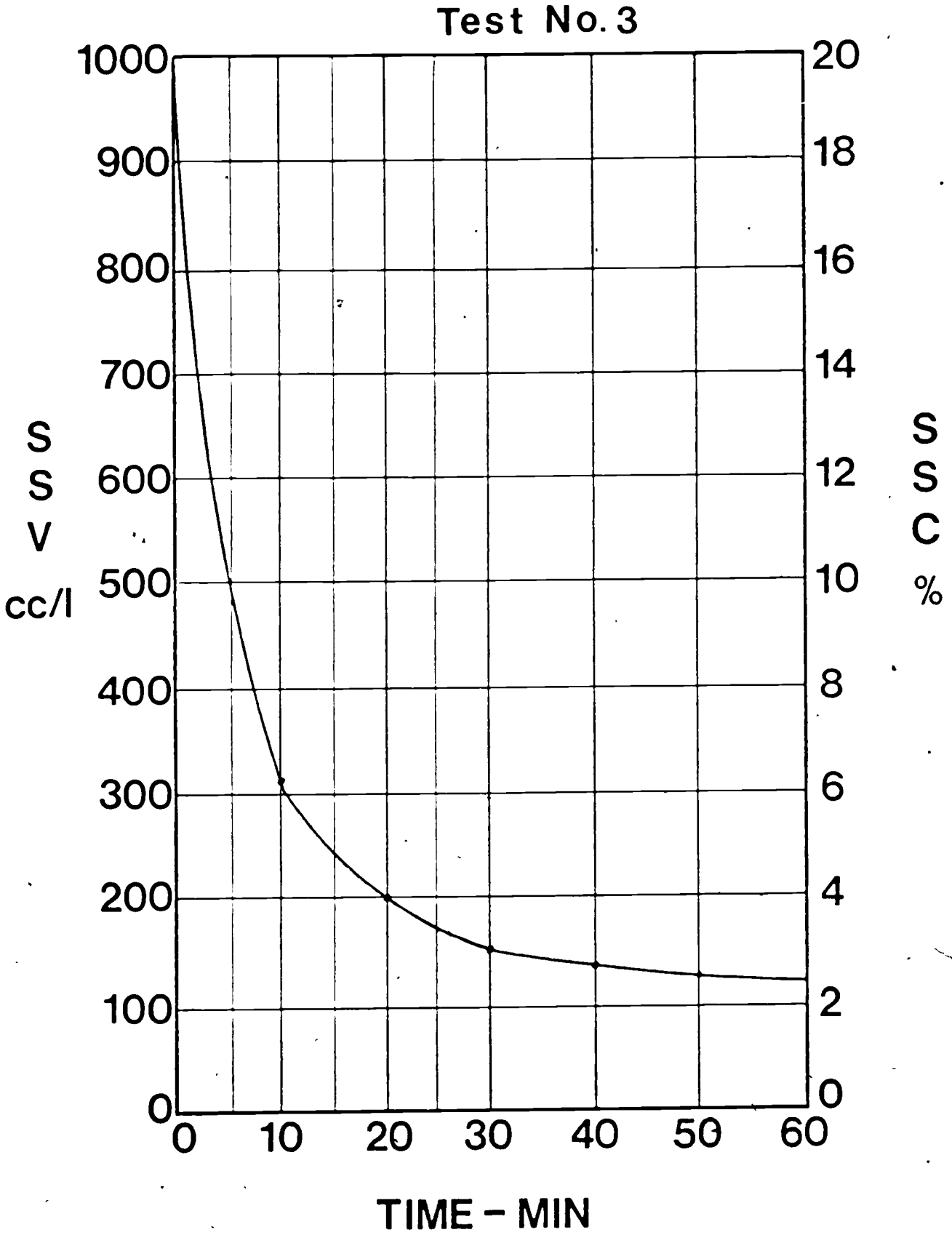
10
20
30
40
50
60
TIME - MIN


Test No. 3
1000
900
800
700
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500
400
300
200
100
0
SSV cc/l
20
18
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SSC %
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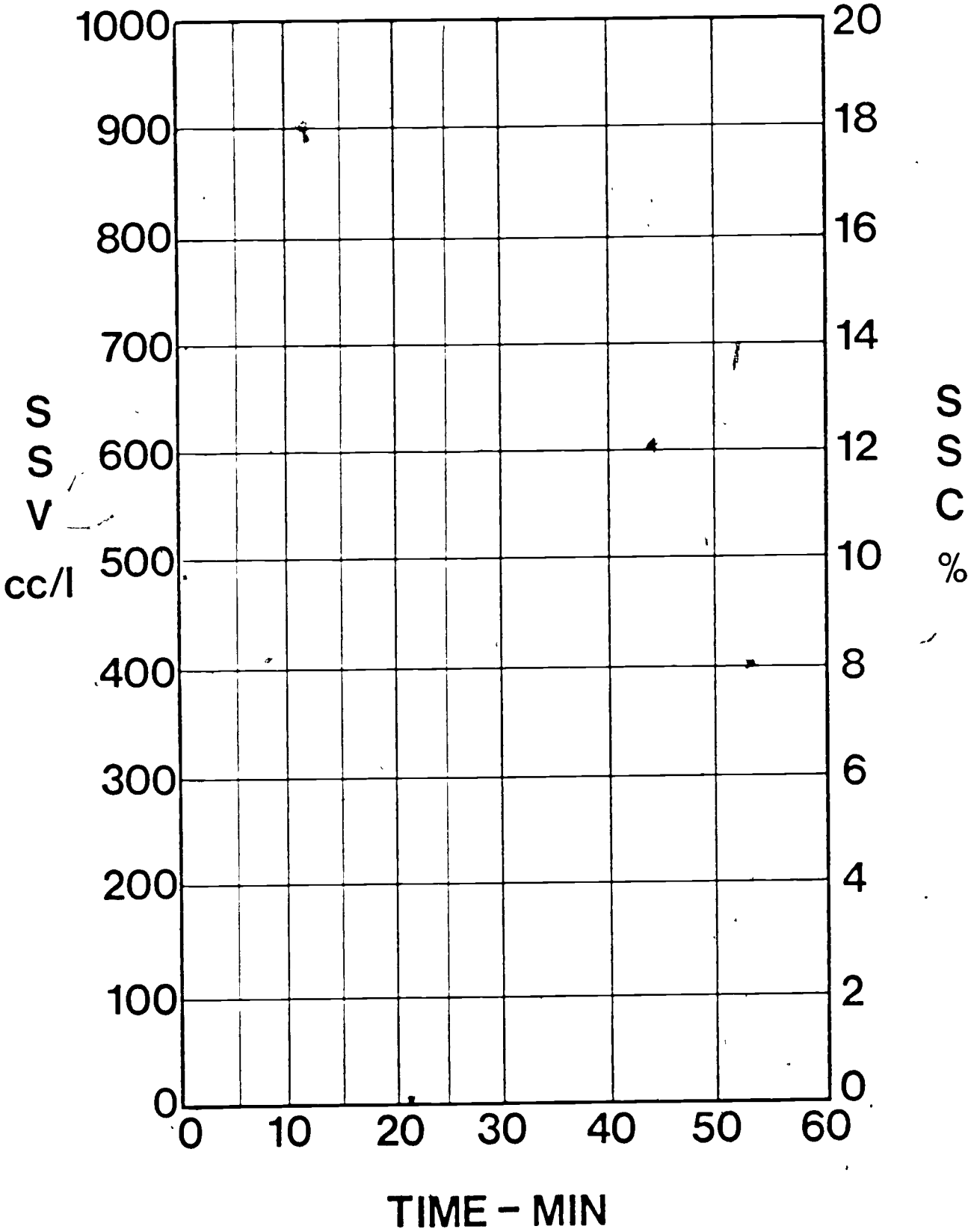
60
TIME - MIN


1000
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S
C
%
0
10
20
30
40
50
60
TIME - MIN

SETTLEOMETER TEST

WORKSHEET

Directions: Place an "X" by the best answer. There is only one best answer for each question.

1. The major purpose for the settleometer test is to:

   a)_____ determine SVI.

   b)__X__ measure the characteristics of solids separation.

   c)_____ measure the dependency of solids on overall plant performance.

   d)_____ determine the decant time.

   e)_____ None of the above.

2. The settleometer test results are given in:

   a)__X__ cc/l.

   b)_____ ml/cc.

   c)_____ cc/ml.

   d)_____ SSC/SSV.

   e)_____ cc/gram.

3. A wide body settleometer is used because:

   a)_____ it's easier to read.

   b)_____ it holds two liters.

   c)__X__ it reduces side wall friction interference.

   d)_____ it allows a large volume of sludge to settle in a small area in a short period of time.

   e)_____ None of the above.

4. When using the settleometer for activated sludge readings should be taken:

a)_____ every 10 minutes for the first hour and every 5 minutes for the next hour.

b)__X__ every 5 minutes for the first half-hour and every 10 minutes for the next half-hour.

c)_____ every 5 minutes during the first hour and every 10 minutes during the next hour.

d)_____ every 10 minutes during the first half-hour and every 5 minutes during the next half-hour.

5. When using the settleometer for aerobic digestion, readings should be taken:

a)__X__ after 30 minutes and then each hour for at least 4 hours.

b)_____ after each hour for 5 hours.

c)_____ each 10 minutes during the first hour and then once each hour for the next 4 hours.

d)_____ only once after the first hour and then wait until it rises.

6. Determine the SSV of the settleometers on the next page.

A. 820 cc/l

B. 550 cc/l

C. 400 cc/l

D. 210 cc/l

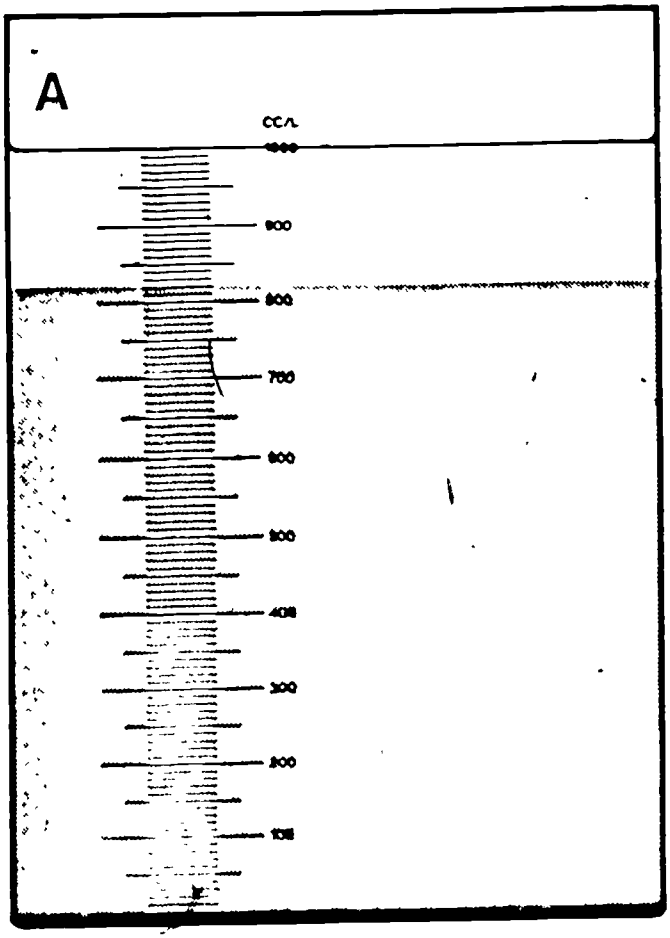
7. Calculate the SSC values for each of the above SSV values if the ATC is 4.5%.

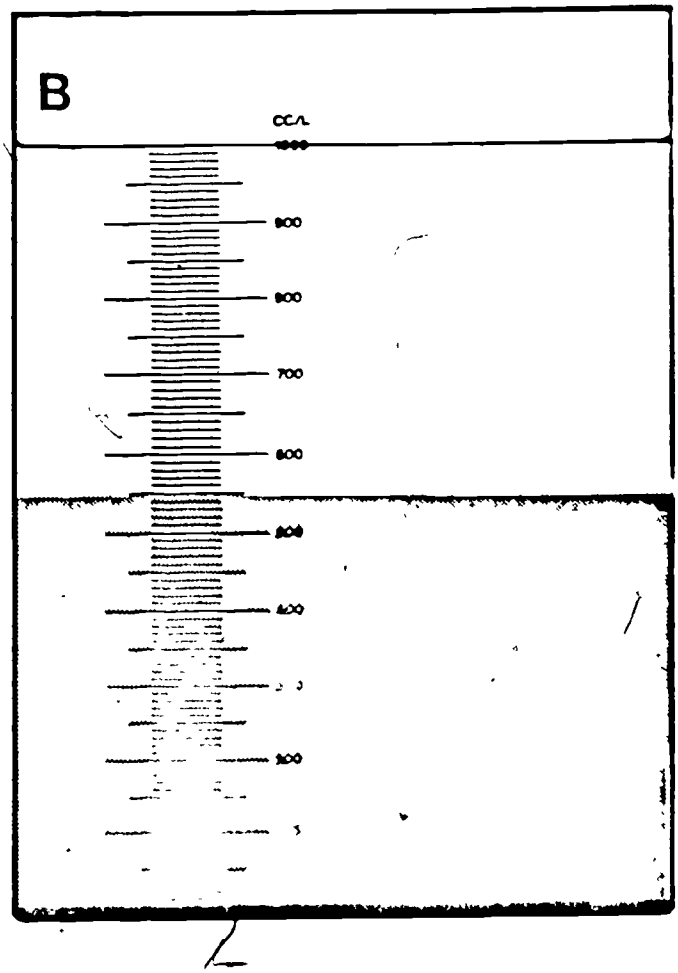
A. 5.5%

B. 8.2%

C. 11.25%

D. 21.4%


A
cc/L
900
800
700
600
500
400
300
200
100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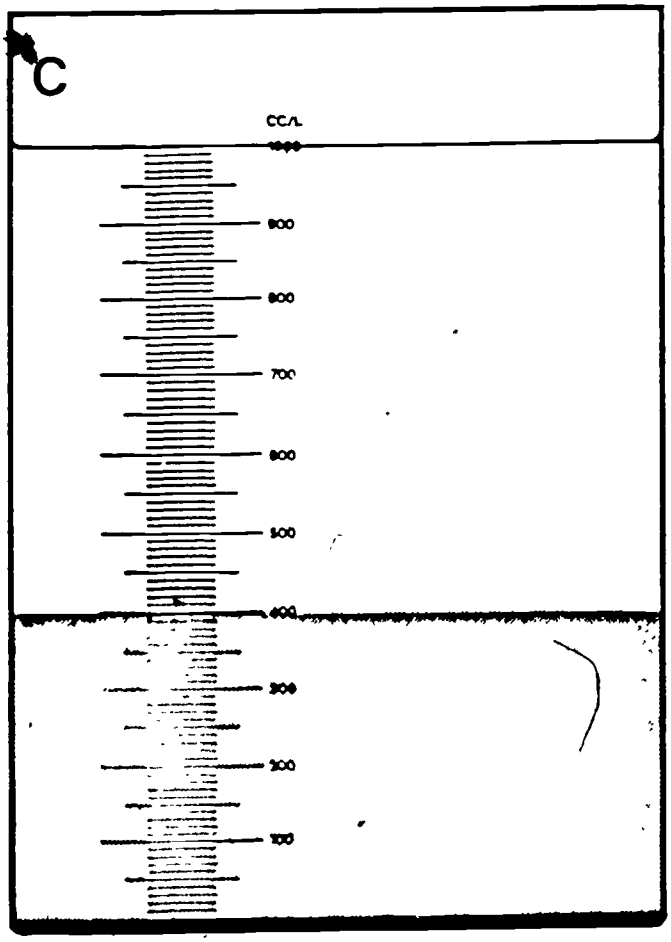
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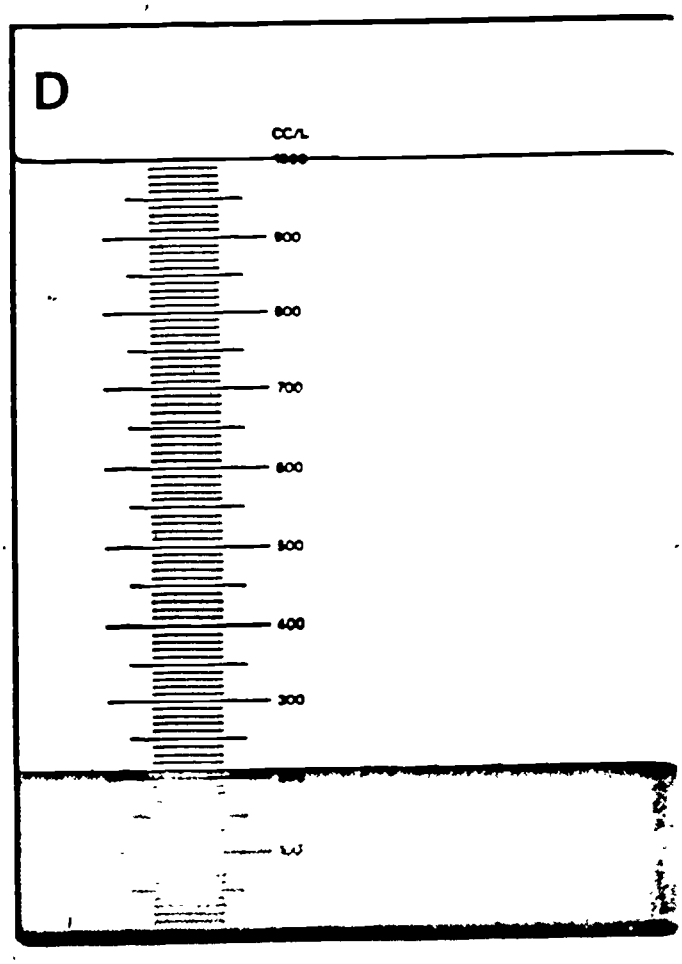
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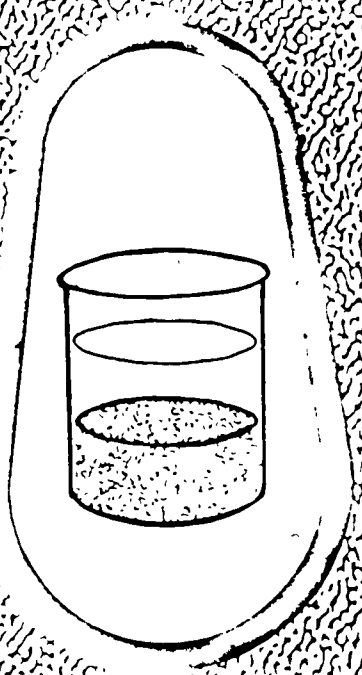
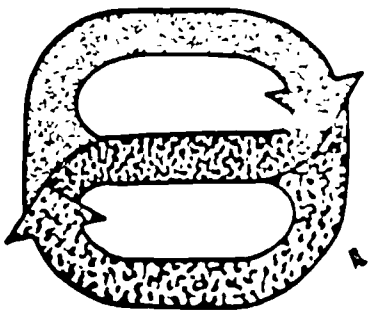
Operational Control Tests

for Wastewater Treatment Facilities



Settleometer

Student Workbook



Linn-Benton Community College
Albany, Oregon

SETTLEOMETER

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United States Environmental Protection Agency
National Training and Operational Technology Center
Cincinnati, Ohio

Developed Under
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August, 1981

SETTLEOMETER

CONTENTS

INTRODUCTION

This module on the determination of solids settleability by use of the settleometer is intended to give the operator the skills needed to obtain consistant and reliable data from the test procedure.
The mention of any brand names should not be taken as an endorsement of that material.
This module is intended to be used by individuals who have completed the NPDES Level I laboratory skills training.

OBJECTIVES

Upon completion of this module you should be able to:

1. Describe the purpose of the settleometer test.
2. Recall the frequency of readings for activated sludge and for aerobic digestion.
3. Recall the sample volume.
4. Recall the settleometer volume.
5. Describe the test procedure.
6. Perform the test procedure.
7. Recall the maximum hold time for sludge that is to be used in this test.

PREREQUISITE SKILLS

In addition to the skills listed in the introduction, the following skills are needed for this test:

1. Ability to use a timer clock.
2. Ability to do simple math calculations.
3. Ability to plot data and draw a curve of best fit.

RESOURCE LIST

Settleometers may be purchased from:

1. Arthur H. Thomas Co.
   Vine Street at 3rd
   P.O. Box 779
   Philadelphia, PA 19105

   Nalgene Settleometer
   and Centrifuge Kit
   #9857-V25

2. SGA Scientific, Inc.
735 Broad Street
Bloomfield, NJ 07003

J S - 1035
Settleometer
2 liter
Double grad.

Further information on the performance of this test may be found by obtaining the following written material:

1. Operational Control Procedures for the Activated Sludge Process, by Al West, available from US EPA - NTOTC Cincinnati, Ohio 45268.

2. Procedures used in Conducting Selected Activated Sludge Control Test, by Owen Boe, available from Linn-Benton Community College, Albany, Oregon 97321.

SETTLEOMETER TEST

INTRODUCTION

The purpose of the settleometer test is to indicate the solids-liquid separation capability of the sludge. The test is commonly used to make this determination on activated sludge entering the secondary clarifier and aerobic digesters, to determine downtime of the sludge.

EQUIPMENT

Settleometer - 2 liter Mallory Direct Reading SGA Scientific, Inc. Catalog #JS-1035, or Nalgene Catalog #1010

Stirring paddle

Timer (Electric Gralab, Model 500 or equivalent)

PROCEDURE

1. COLLECT SAMPLE.

   Collect at least 2.5 liters of sample and deliver to the lab within 15 minutes.

2. MIX SAMPLE.

   After the sample has been collected, it should be thoroughly but gently mixed and poured into the settleometer without delay.

3. POUR SAMPLE INTO SETTLEOMETER.

   Fill the settleometer to the 1000 cc mark. Although the settleometer actually holds 2 liters, it is calibrated from 0 - 1000 cc.

4. STIR SAMPLE.

   Slowly stir the sample in the settleometer with a paddle to insure that it is completely mixed. Then, use the paddle to stop the swirling motion of the liquid, slowly and carefully remove the paddle and start timing.
   Pieces of plexaglass the appropriate length make excellent stirring paddles. These pieces should be slightly less in width than the inside diameter of the settleometer.

5. READ SETTLEOMETER.

For Activated Sludge

After 5 minutes have elapsed, read the sludge blanket level (the interface between the solids and the clear liquid above the solids) in cc/l and record this reading. Read at five-minute intervals until 30 minutes have elapsed. During the next 30 minutes, read at 10 minute intervals.

Readings would be made at 5, 10, 15, 20, 25, 30, 40, 50, and 60 minutes. The sludge blanket level readings taken at these times are readings of the volume of settled sludge in cc/l.

6. RECORD DATA.

Record values of data, appearance of supernatant, appearance of sludge and of the sludge supernatant interface.

For Aerobic Digesters

Read and record the sludge blanket level in cc/l after 15 minutes, 30 minutes, and 1 hour, then once per hour until the sludge reaches ultimate compaction or rises. Determine the time and level of ultimate compaction and then the rise time of the sludge.

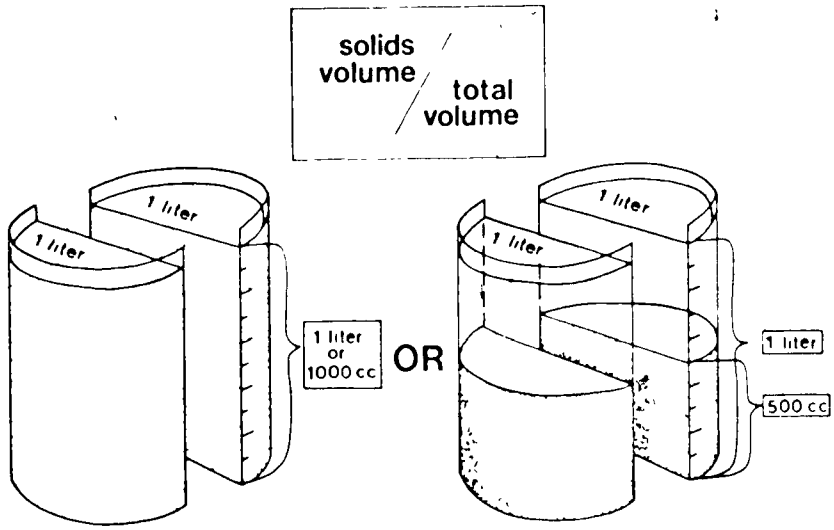
7. WASH SETTLEOMETER.

After the last reading has been taken, the settleometer should be washed with soapy water, rinsed with tap water, and dried with a towel or allowed to drip dry.

SUPPLEMENTARY MATERIAL

SETTLEOMETER SCALE

In order to understand the settleometer you must first realize that the settleometer holds 2 liters. Secondly, the scale indicates a relationship between the sludge value (cc) and the volume of the container (l). What we just said was that the scale is given as a ratio of cc/l. It would not make any difference how much the settleometer held (2 liters or 100 gallons). The ratio of sludge to total volume when the settleometer is full is 1000 cc per liter of volume.



SETTLED SLUDGE VOLUME (SSV)

As the sludge settles the volume of sludge is observed and noted on the data sheet. This volume is read as cc/l and called the SSV or Settled Sludge Volume.

SETTLED SLUDGE CONCENTRATION (SSC)

When the settleometer is used in conjunction with the activated sludge process it is often desirable to compute the concentration of the settled sludge. This concentration is called the SSC or Settled Sludge Concentration. This value is influenced by the length of the settling time.

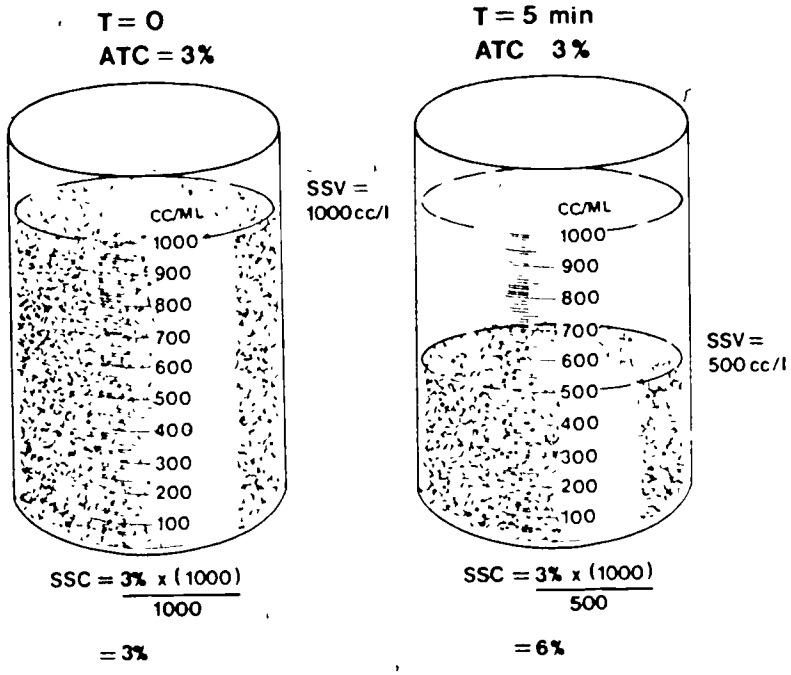
Here is a data sheet from a 60 minute settleometer test. (We have filled in both the SSV and SSC values.) Let's see how the SSC values are computed. The formula for calculations is as follows:

Time of Test	1	
Time	SSV CC/L	SSC %
0	1000	3
5	500	6
10	400	7.5
15	325	9.2
20	290	10.3
25	260	11.5
30	250	12
40	220	13.6
50	200	15
60	200	15

$$SSC = \frac{ATC\ (1000)}{SSV}$$

Where the ATC is the Aeration Tank Concentration in percent as determined by the centrifuge test.

Four examples from the above data should serve to give a direction in this calculation. We have chosen T = 0, time = 5 minutes, time = 30 minutes, and time = 60 minutes.



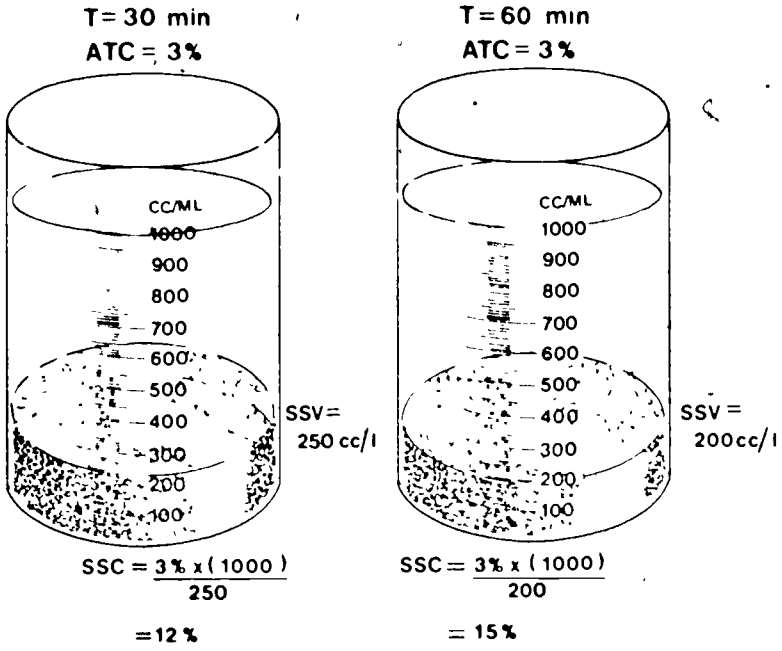
$SSC = \frac{3\% \times (1000)}{1000}$

$= 3\%$

$SSC = \frac{3\% \times (1000)}{500}$

$= 6\%$

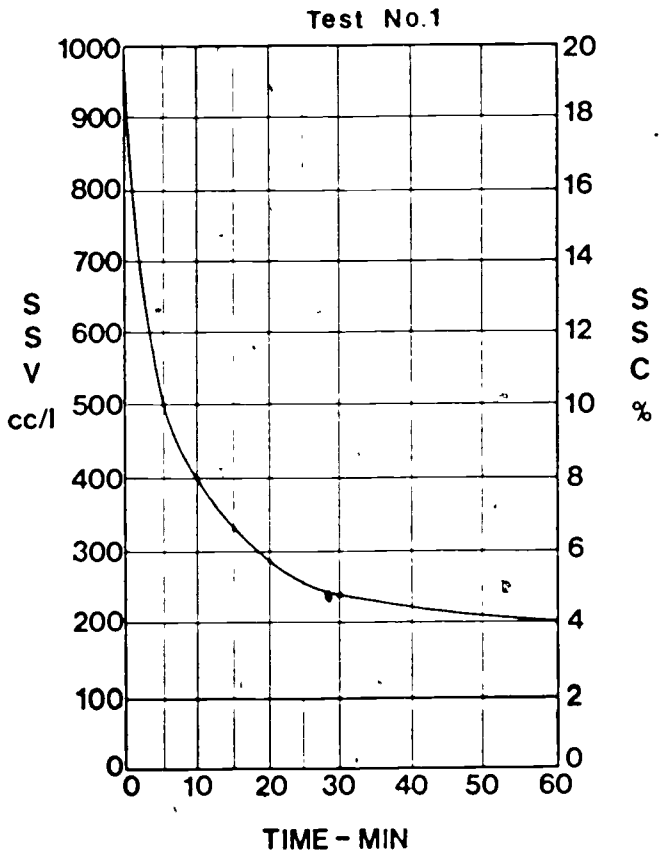
Notice that when the sludge has settled to 1/2 of the volume (500 cc/l) that the concentration will double. Isn't that what you would expect? The sludge is now contained in 1/2 of the volume. It therefore must be twice the concentration. Here are the other two examples:



SSV CURVES

The data can also be plotted on a curve. This becomes useful in making operational control decision.

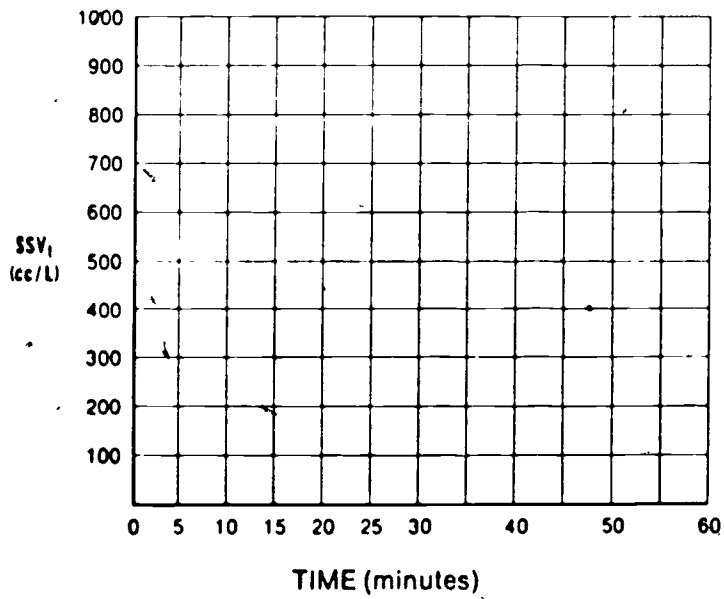
Time of Test 1		
Time	SSV CC/L	SSC %
0	1000	3
5	500	6
10	400	7.5
15	325	9.2
20	290	10 3
25	260	11.5
30	250	12
40	230	13 6
50	200	15
60	200	15



Here are some data for you to calculate. The answers are found in the instructor's manual.

SST (min)	SSV (cc/L)	$SSC_t = 1000 \times ATC/SSV_t$
0	1000	
5	990	
10	970	
15	950	
20	925	
25	900	
30	885	
40	825	
50	750	
60	700	
2 hrs.		
3 hrs.		
hrs.		
hrs.		

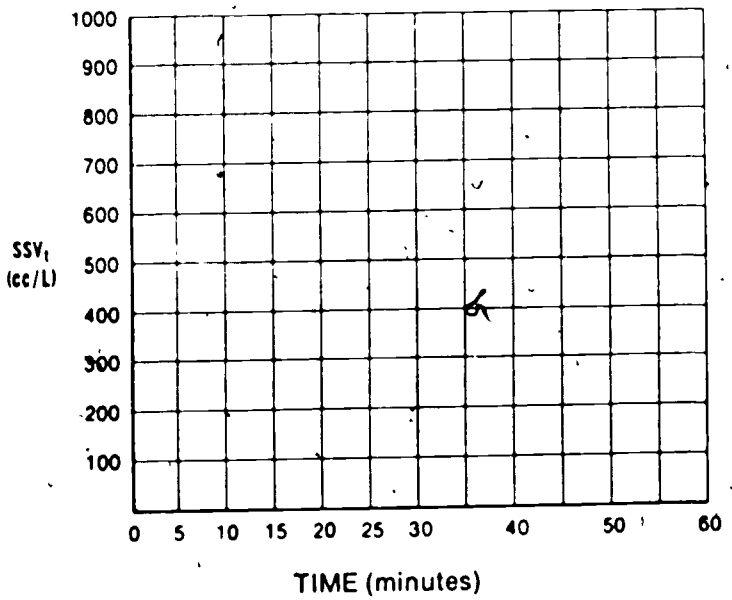
Settled Sludge Volume Curve



Here is a blank data sheet. Your instructor may have some data for you to use to fill in the blanks.

SST (min.)	SSV (cc/L)	$SSC_t = 1000 \times ATC/SSV_t$
0	1000	
5		
10		
15		
20		
25		
30		
40		
50		
60		
2 hrs.		
3 hrs.		
hrs.		
hrs.		

Settled Sludge Volume Curve



SETTLEOMETER DATA

Activated Sludge

Date	
Sample location	
Analyst	
Time of Test	
$SSC = \frac{(ATC)\ (1000)}{SSV}$	

Time	SSV cc/l	SSC %
0	1000	
5		
10		
15		
20		
25		
30		
40		
50		
60		

Observations:

Floc

[ ] flocculant

[ ] dispersed

Interface

[ ] well defined

[ ] ragged

Supernatant

[ ] clear

[ ] turbid

[ ] pin floc

[ ] straggler floc

Comments: (odor, color, etc.)

Rise Time_____ hrs.

Date	
Sample location	
Analyst	
Time of Test	
$SSC + \frac{(ATC)\ (1000)}{SSV}$	

Time	SSV cc/l	SSC %
0	1000	
5		
10		
15		
20		
25		
30		
40		
50		
60		

Observations:

Floc

[ ] flocculant

[ ] dispersed

Interface

[ ] well defined

[ ] ragged

Supernatant

[ ] clear

[ ] turbid

[ ] pin floc

[ ] straggler floc

Comments: (odor, color, etc.)

Rise Time_____ hrs.

SETTLEOMETER DATA

Aerobic Digestion

Date _____

Sample Location _____

Analyst _____

Time of Test _____

Time	SSV cc/l
15 min.	
30 min.	
1 hr.	
2 hrs.	
3 hrs.	
4 hrs.	
5 hrs.	

Rise Time _____

Observations:

Supernatant

☐ clear

☐ turbid

Comments: (odor, color, etc.)

Date _____

Sample Location _____

Analyst _____

Time of Test _____

Time	SSV cc/l
15 min.	
30 min.	
1 hr.	
2 hrs.	
3 hrs.	
4 hrs.	
5 hrs.	

Rise Time _____

Observations:

Supernatant

☐ clear

☐ turbid

Comments: (odor, color, etc.)

SETTLOMETER AND CENTRIFUGE TEST DATA

SST (min)	SSV (cc/L)	$SSC_t = 1000 \times ATC/SSV_t$
0	1000	
5		
10		
15		
20		
25		
30		
40		
50		
60		
2 hrs.		
3 hrs.		
hrs.		
hrs.		

DAY _____

DATE _____

SAMPLING TIME _____

OPERATOR _____

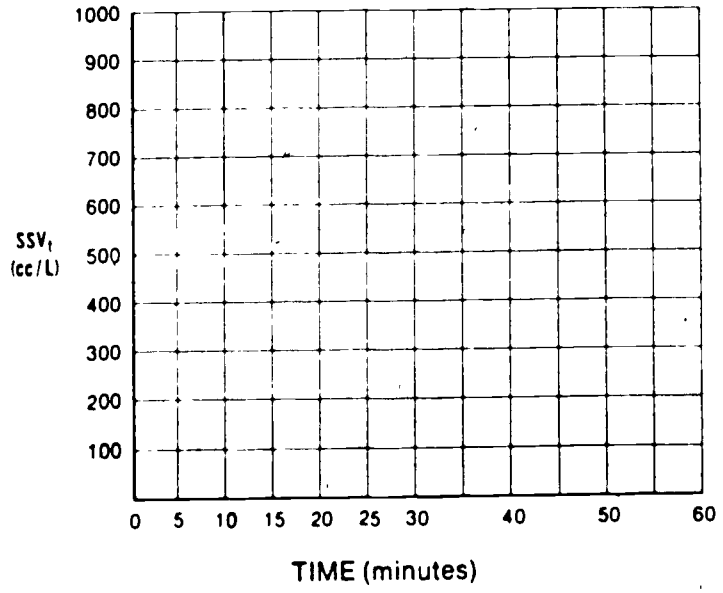
TANK IDENT _____

RISE TIME _____

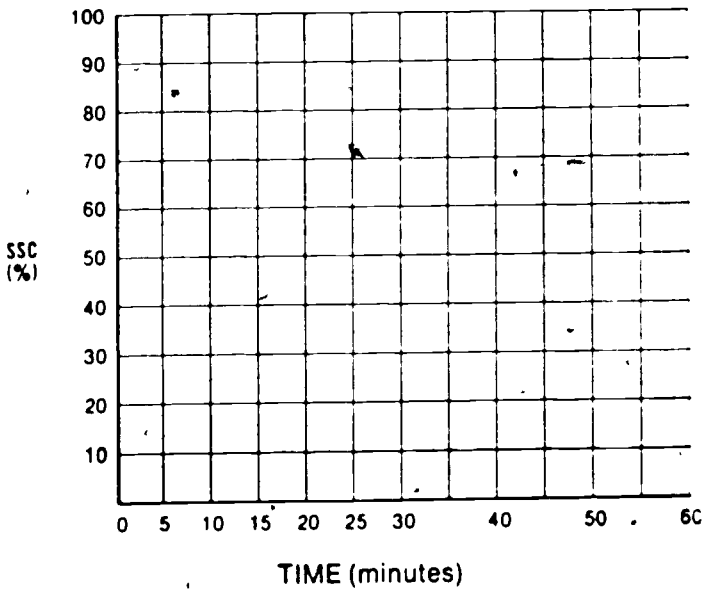
ATC _____

RSC _____

1. Settled Sludge Volume Curve



2. Settled Sludge Concentration Curve



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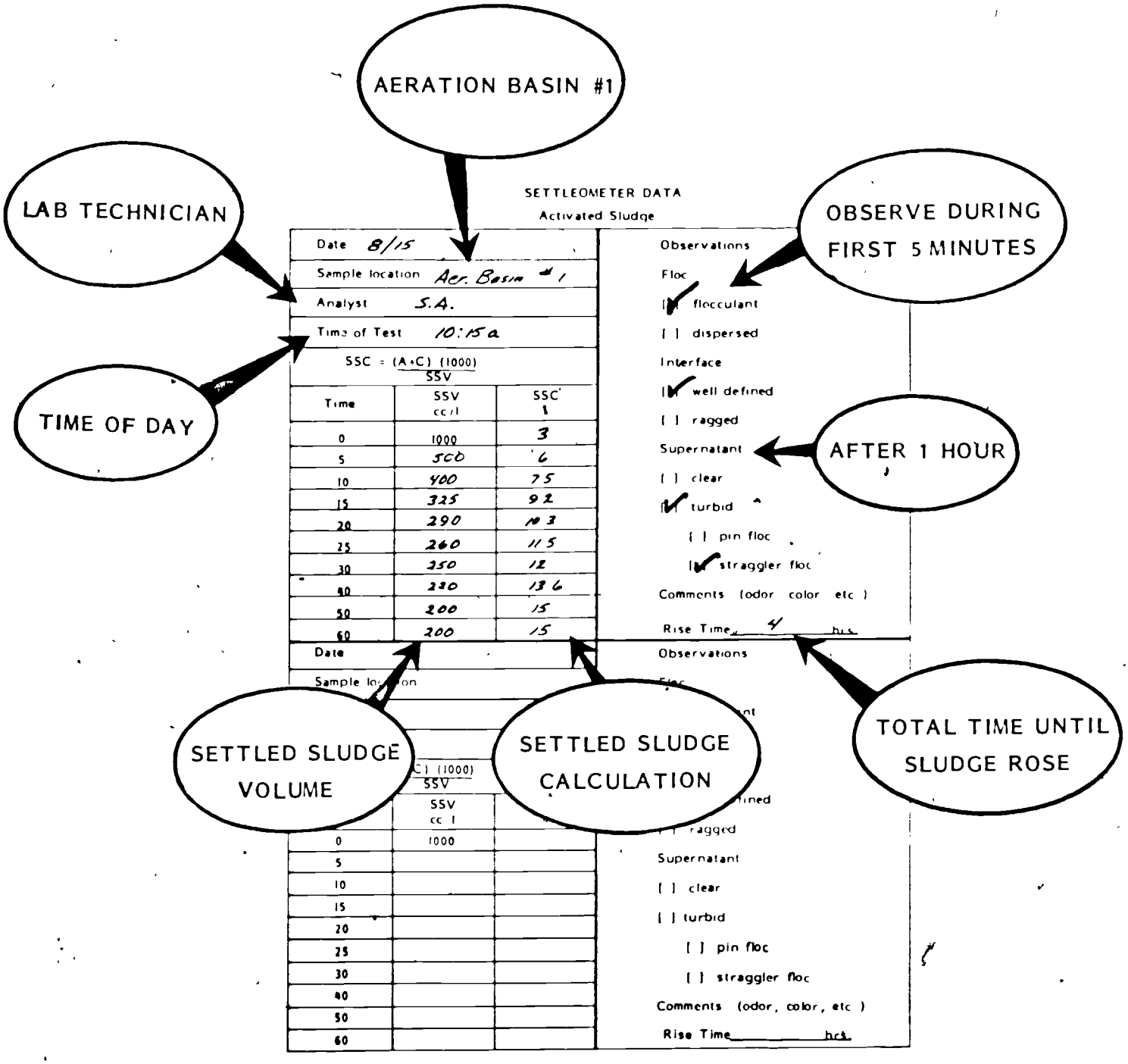
SYBRON|Nalge

Nalge Company
Division of Sybron Corporation
Rochester New York 14602 U.S.A.

SAMPLE DATA SHEET



SETTLEOMETER DATA
Activated Sludge

Date 8/15
Sample location Aer. Basin #1
Analyst S.A.
Time of Test 10:15a

$SSC = \frac{(A \times C)\ (1000)}{SSV}$

Time	SSV cc/l	SSC %
0	1000	3
5	500	6
10	400	7.5
15	325	9.2
20	290	10.3
25	260	11.5
30	250	12
40	220	13.6
50	200	15
60	200	15

Observations
Floc
[✓] flocculant
[ ] dispersed
Interface
[✓] well defined
[ ] ragged
Supernatant
[ ] clear
[✓] turbid
[ ] pin floc
[✓] straggler floc
Comments (odor color etc.)
Rise Time 4 hrs.

Date
Sample location
Analyst
Time of Test

$SSC = \frac{(A \times C)\ (1000)}{SSV}$

Time	SSV cc/l	SSC %
0	1000	
5		
10		
15		
20		
25		
30		
40		
50		
60		

Observations
Floc
[ ] flocculant
[ ] dispersed
Interface
[ ] well defined
[ ] ragged
Supernatant
[ ] clear
[ ] turbid
[ ] pin floc
[ ] straggler floc
Comments (odor, color, etc.)
Rise Time _____ hrs.

PROCEDURE SUMMARY

PROCEDURE

1. Collect 2.5 liters sample
2. Deliver to lab within 15 min.
3. Mix sample
4. Pour 2 liters into settleometer
5. Stir
6. Stop motion of sludge

ACTIVATED SLUDGE

1. Read every 5 minutes for first 30 minutes and every 10 minutes for next 30 minutes.

AEROBIC DIGESTOR

1. Read at 15 and 30 minutes
2. Read rise time

Settleometer

The above procedure summary is designed as a laboratory aid. It may be cut out and attached to a 5" X 7" index card for convenient reference at the laboratory bench. To protect the card you may wish to cover it, front and back, with clear, self-adhesive shelf paper or similar clear material.

SETTLEOMETER TEST

WORKSHEET

Directions: Place an "X" by the best answer. There is only one best answer for each question.

1. The major purpose for the settleometer test is to:

   a)_____ determine SVI.

   b)_____ measure the characteristics of solids separation.

   c)_____ measure the dependency of solids on overall plant performance.

   d)_____ determine the decant time.

   e)_____ None of the above.

2. The settleometer test results are given in:

   a)_____ cc/l.

   b)_____ ml/cc.

   c)_____ cc/ml.

   d)_____ SSC/SSV.

   e)_____ cc/gram.

3. A wide body settleometer is used because:

   a)_____ it's easier to read.

   b)_____ it holds two liters.

   c)_____ it reduces side wall friction interference.

   d)_____ it allows a large volume of sludge to settle in a small area in a short period of time.

   e)_____ None of the above.

4. When using the settleometer for activated sludge readings should be taken:

a)_____ every 10 minutes for the first hour and every 5 minutes for the next hour.

b)_____ every 5 minutes for the first half-hour and every 10 minutes for the next half-hour.

c)_____ every 5 minutes during the first hour and every 10 minutes during the next hour.

d)_____ every 10 minutes during the first half-hour and every 5 minutes during the next half-hour.

5. When using the settleometer for aerobic digestion, readings should be taken:

a)_____ after 30 minutes and then each hour for at least 4 hours.

b)_____ after each hour for 5 hours.

c)_____ each 10 minutes during the first hour and then once each hour for the next 4 hours.

d)_____ only once after the first hour and then wait until it rises.

6. Determine the SSV of the settleometers on the next page.

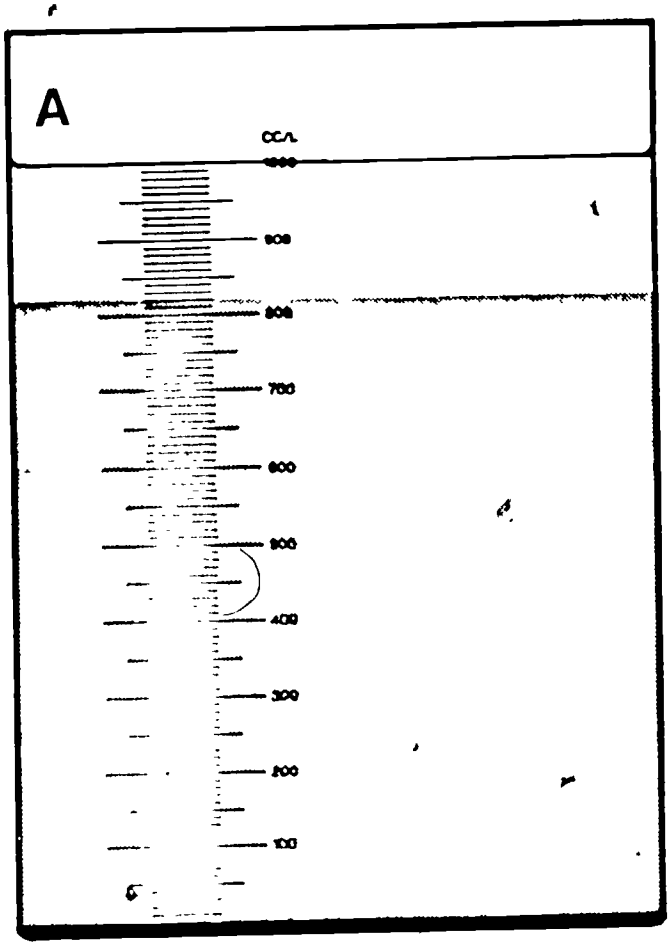
A._____ C._____

B._____ D._____

7. Calculate the SSC values for each of the above SSV values if the ATC is 4.5%.

A._____ C._____

B._____ D._____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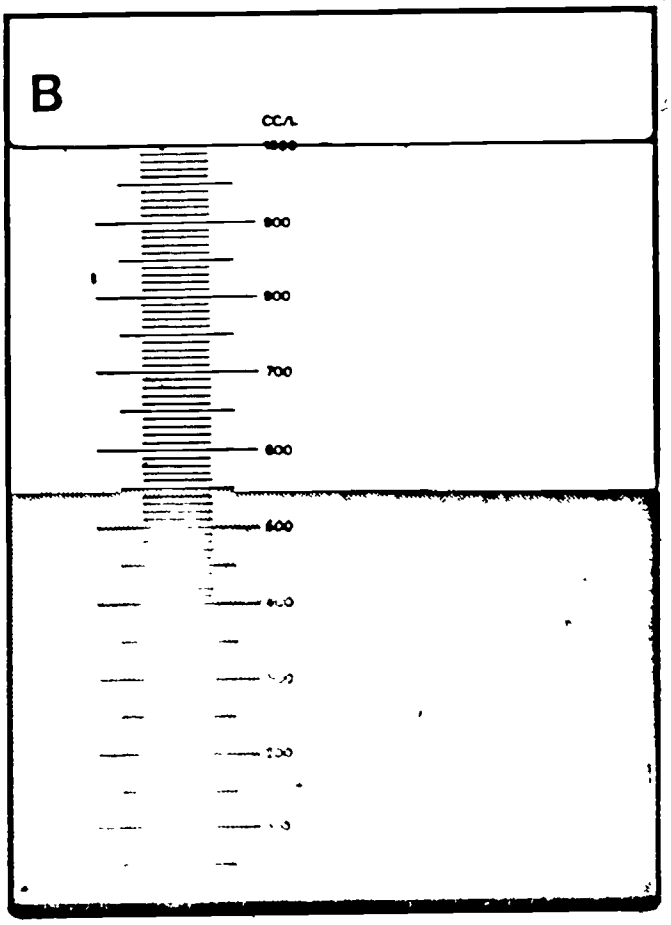
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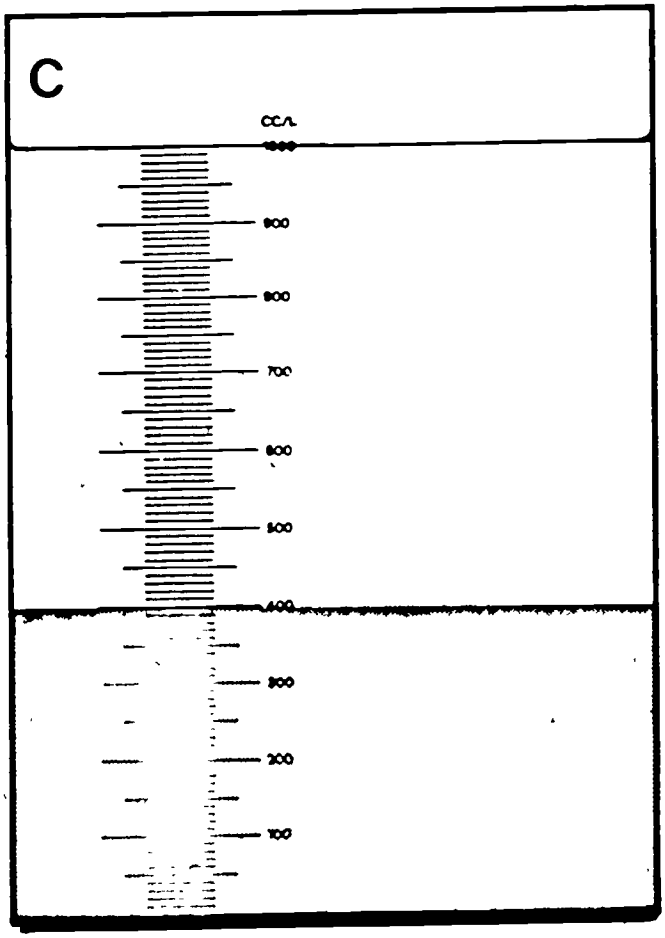
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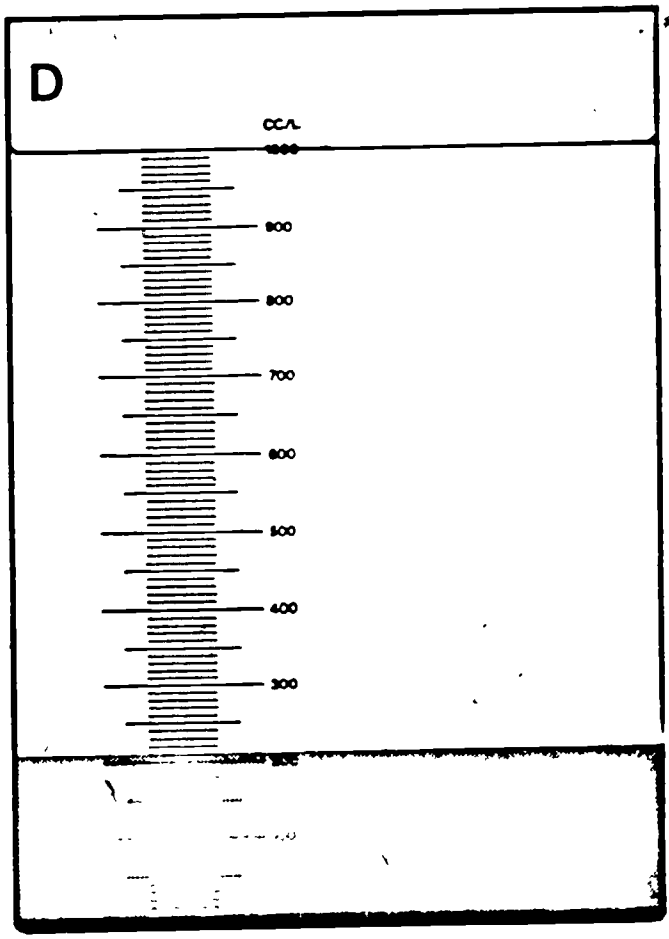
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